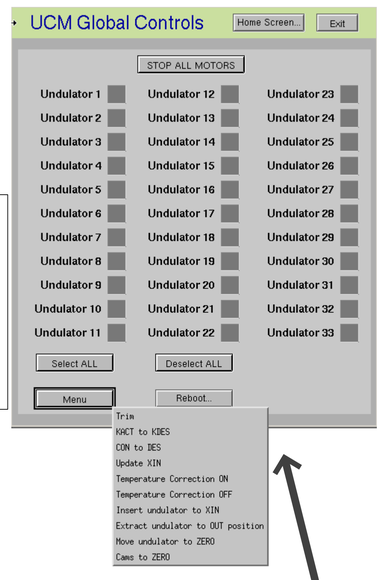
The Development of the Undulator Controls Module at the Linac Coherent Light Source

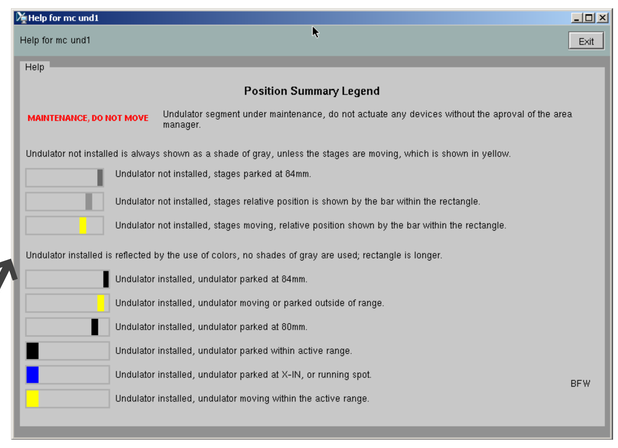
Arturo Alarcon

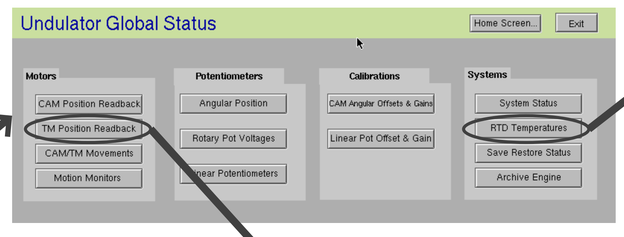
Introduction

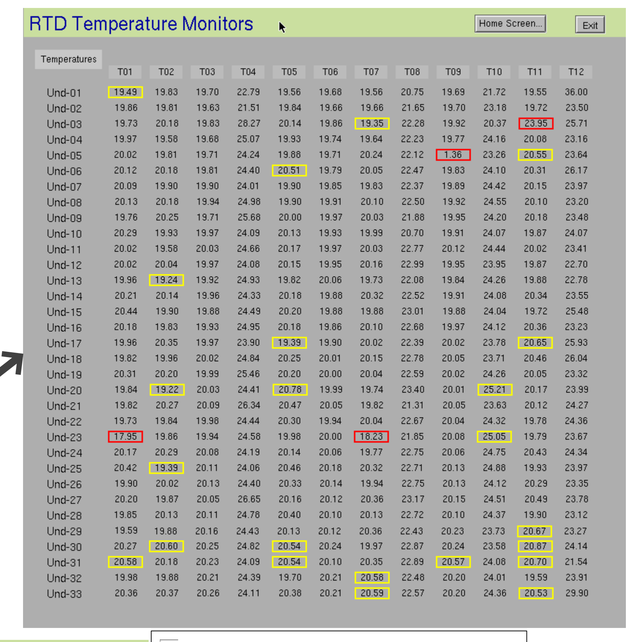
The Linac Coherent Light Source, LCLS, at the SLAC National Accelerator Laboratory, SNAL, is the first hard x-ray Free Electron Laser. The Undulator Controls Module, UCM, controls five cams and two translation stages that regulate the position of each of the 33 permanent undulator magnet segments within 10 microns. The UCM package, hardware and software, was designed and built by the Advanced Photon Source at Argonne. The UCM is still evolving, and many improvements can still be made to provide and more user friendly and stable control system. A functional diagram of the current system, from the perspective of the user, is shown below.

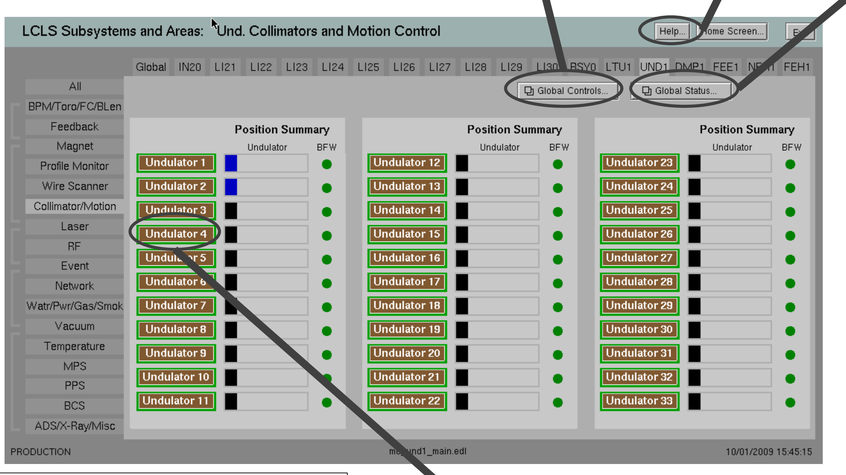
Selected functions are available from the Global Controls to control all or a selection of undulator segments.

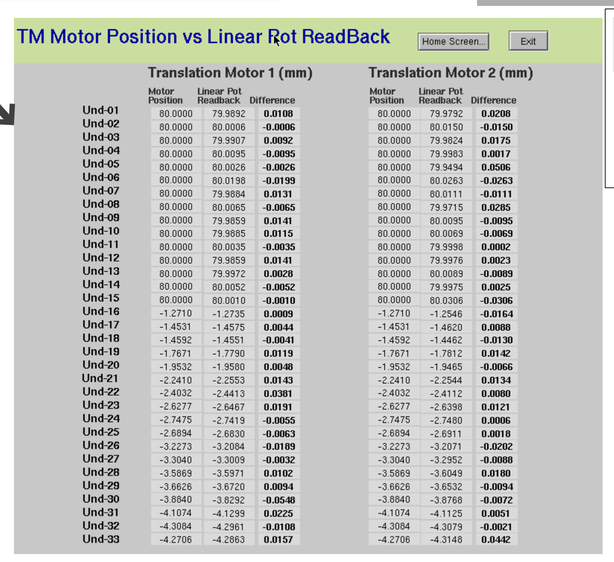












Examples of global status pages, with status for selected readbacks for all 33 undulators.

Alarm summaries, undulator position summaries, and links to individual segment controls, also Global Controls, and Global Statuses can be found from this page.

VME crate containing a Motorola MVME 3100 CPU running RTEMS 4.9.1, and EPICS 3.14.10, an Idustry Pack carrier with an ADC, an RS232 communication card for the smart motors, and a digital input/output card.

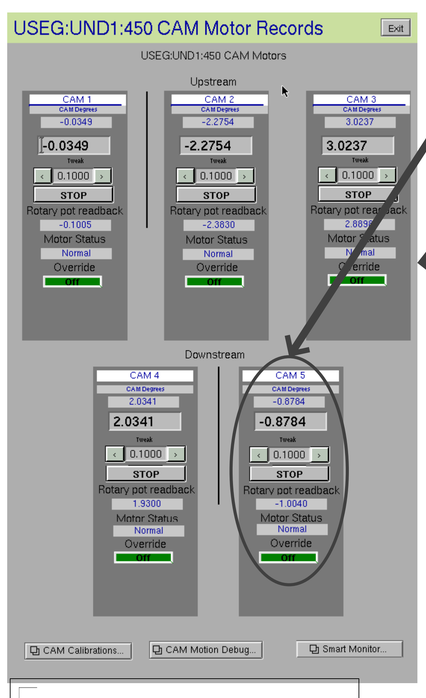
Quadrupole magnet.

Undulator segment.

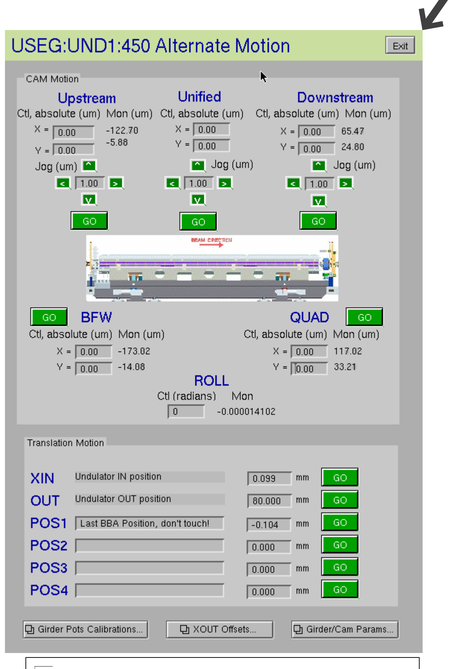
Undulator Control Module Interface, UCMI, built to interface individual devices with the EPICS, controls system, Input Output Controller and provide interlocks.

Undulator Motor Power Interface, UMPI, built to house interlocked power supplies.

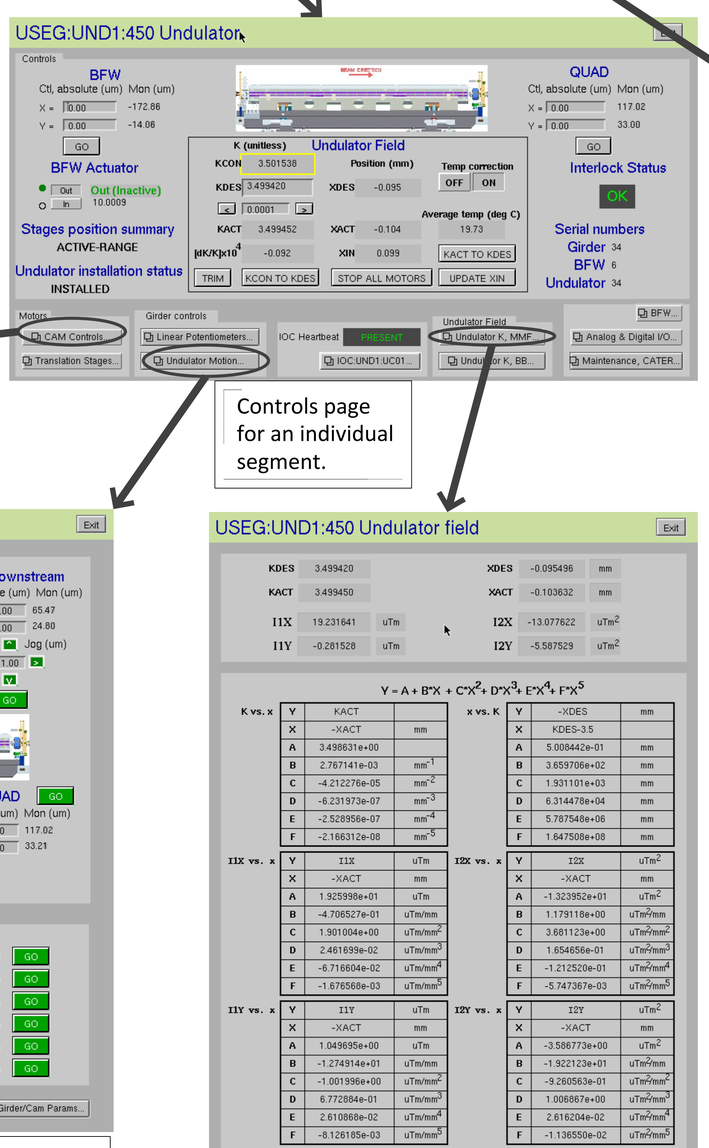
Undulator segment 04



Cam motors page.

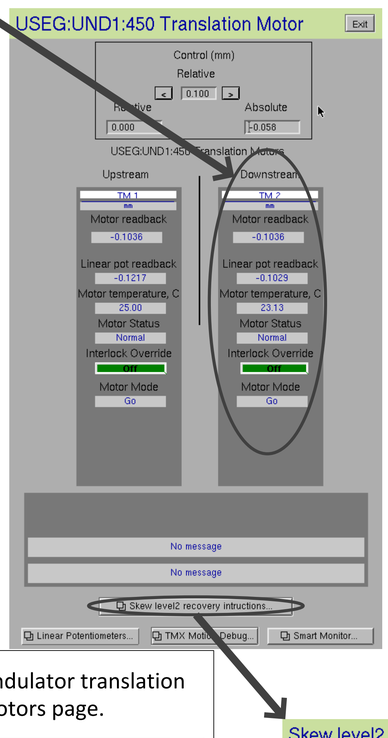


Detailed girder motion controls.

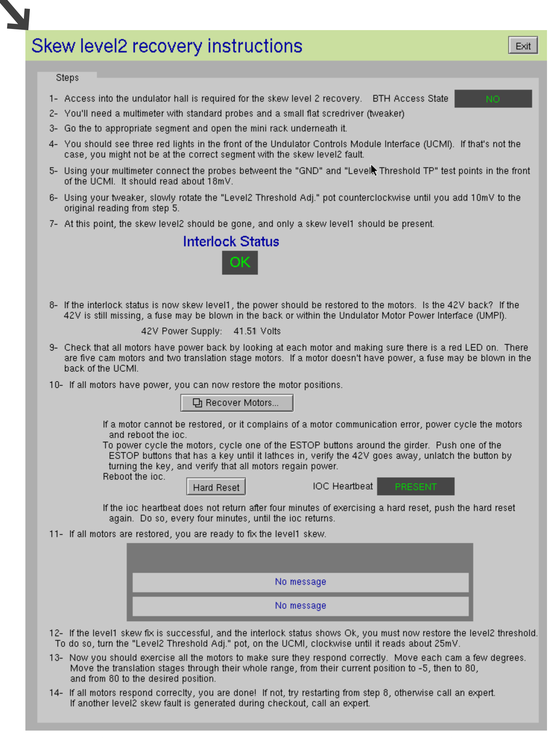


Controls page for an individual segment.

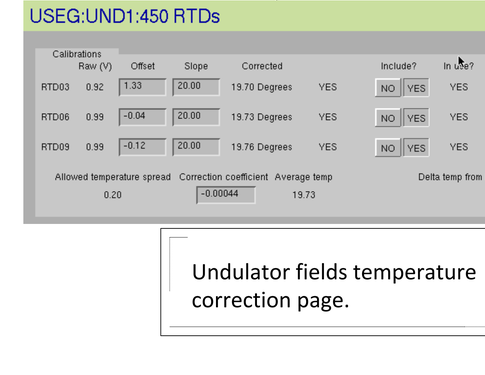
Undulator fields calculations page.



Undulator translation motors page.



Skew interlock recovery instructions.



Undulator fields temperature correction page.